VIM AND FDM FOR SOLVING BOLTZMANN EQUATION OF SELF-GRAVITATING GAS-DUST SYSTEM

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Specially dedicated to my beloved family
and those people who have given consistent support and guide me.

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ABSTRACT

In this research, Boltzmann equation of Self-Gravitating Gas-Dust System is introduced. The model consists of dust component equations, gas dynamics equations and also Poisson equation. The mathematical model is used in order to visualize the movement of the gas and dust in environment. This research only focuses on sequential algorithm and solving the model in 2 Dimension (2-D). Numerical solutions obtained by using the Variational Iteration Method (VIM) and Finite Difference Method (FDM). The results are computed by using Borland C++ Builder, MATLAB 2008a and MAPLE 13. Then, the graphs are visualized by using Microsoft excel. The result is based on numerical analysis. Numerical analysis under consideration is pattern of the graph, gradient of the graph, time execution and computational complexity. The movement of the gas-dust showed differently with the different method. At the end, the results show that the VIM and FDM are successfully in visualizing the movement of the gas-dust in reality. Based on theoretically, VIM is in solving gas-dust problem compared to FDM.

ABSTRAK

Dalam kajian ini, persamaan Boltzmann telah diperkenalkan. Model ini terdiri daripada persamaan habuk, persamaan gas dan juga persamaan Poisson. Model matematik ini digunakan untuk melihat pergerakan habuk dan gas dalam persekitaran. Kajian ini hanya memberi tumpuan pada algoritma berjujuran dalam 2 dimensi (2-D). Penyelesaian berangka telah diperolehi melalui kaedah lelaran variasi dan kaedah beza terhingga. Penyelesaian ini telah dilakukan dengan menggunakan perisian seperti Borland C++ Builder, MATLAB 2008a dan MAPLE 13 Manakala, graf dilakarkan menggunakan microsof excel. Keputusan adalah berdasarkan analisis berangka. Analisis berangka yang di kaji adalah corak pergerak graf, kecerungan graf, masa pelaksanaan dan pengiraan komplek. Pergerakan habuk dan gas menunjukkan perbezaan apabila menggunakan kaedah penyelesaian yang berbeza. Hasil kajian menunjukkan kaedah lelaran variasi dan kaedah beza terhingga telah berjaya dalam mengambarkan pergerakan-pergerakan habuk-gas di alam realiti. Berdasarkan teori, kaedah lelaran variasi adalah keadah yang berkesan untuk menyelesaikan masalah habuk dan gas berbanding kaedah beza terhingga.